

## Chapter 6. Air Quality and Energy Analysis

### Air Quality Conformity

Air quality has become an increasing concern as the nature and extent of pollution have become better identified and its adverse effects upon the public health made clearer. Federal legislation such as the Clean Air Act Amendments of 1990 (CAAA) and TEA-21 have detailed the linkage between transportation planning and air quality. The CAAA set air quality standards through the National Ambient Air Quality Standards (NAAQS). In areas where that standard is not met, it must be demonstrated that transportation plans and projects will reduce motor vehicle emissions.

Dutchess County is part of the Mid-Hudson Ozone Non-attainment Area (Figure 6-1), which also includes Putnam and Northern Orange counties. In 1991 the area was designated a Marginal Non-attainment Area with an expected attainment date of 1993. Additional exceedences were measured in 1991 and 1993, and the region was designated a Moderate Non-attainment Area in late 1994 and that classification is still in effect.

The PDCTC staff and NYSDOT Environmental Analysis Bureau (EAB) have completed the required analysis of *Connections 2025*. CAAA and TEA-21 regulations require that Transportation Planning documents, such as *Connections 2025*, demonstrate that they will make the air cleaner. The process of showing that the plan is in compliance with these requirements involves modeling all recommendations that affect air quality using an EPA computer program called MOBILE6. This air quality modeling software calculates expected rates of volatile organic compounds (VOC) and nitrogen oxides (NOx) that vehicles in Dutchess County are likely to emit in various conditions for milestone forecasting years.

As part of an ozone Non-attainment area the PDCTC must undergo a conformity process for Plans and TIPs. The critical elements of the conformity determination process are:

- Identify all non-exempt and regionally significant projects
- Transportation Modeling
- Regional Emissions Modeling
- Emissions Analysis (the emissions test for conformity)
- Public Participation and Review
- Conformity Determination Statement
- FHWA/FTA approval of MPO determination
- Interagency Consultation at all steps

The first step is determining which projects might affect air quality. In general, projects such as safety improvements, resurfacing, bridge repair, and bus replacements, which maintain current levels of service or capacity, are considered **exempt** from the conformity analysis. Similarly, projects that result in operations improvements, but do not increase capacity, like intersection widening, are also excluded from the analysis.

**Regionally Significant** projects are transportation projects (other than exempt projects) that are on a facility, which serves regional transportation needs and would normally be included in the modeling of a metropolitan area's transportation network. This includes, at a minimum, all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel.

**Non-exempt** projects include highway and road projects that increase capacity by at least one travel lane, and transit projects that change capacity on a fixed route system. The Non-exempt determination is made if the project type is not found in the list of exempt projects derived from "Table 2- Exempt Projects" in 40 CFR Part 93.126, 93.127 and NYCRR Part 240.27.

All of the projects in *Connections 2025* were evaluated for applicability using the guidance in Appendix B and Appendix C of NYSDOT-EABs conformity process guidance. PDCTC staff then developed a list of non-exempt and regionally significant projects. This list of projects was forwarded to NYSDOT-Environmental Analysis Bureau (EAB) on August 8, 2003 for dissemination to the ICG. On August 28, 2003 we received concurrence from the ICG on our list of projects that must be included in the Regional Emissions Analysis. A summary of the short-and long-term plan recommendations that were included in the air quality modeling process is presented in Figure 6-2.

**FIGURE 6-2 Air Quality Conformity Projects (Non-exempt or Regionally Significant)**  
*(Dates reflect full operation)*

**Short-Term (2002-2006)**

- Highway Projects
  - Rt. 9 Service Road (NYSDOT) - 2006
  - Rt. 9: CR 93 (Myers Corners Rd.) to Mesier Ave. (NYSDOT) – 2006
- Metro-North Parking Improvements
  - Wassaic Parking Expansion (MTA/Metro-North Railroad) – 2005
- Demand Management Projects
  - TDM Unit Activities - On-going
  - Regional Ridesharing Program (MetroPool) - On-going
  - Taconic State Parkway Park and Ride (NYSDOT) - TBD
  - Regional Bus Services - Dutchess to Putnam County (DC LOOP) – 2003

**Long-Term (2007-2025)**

- Highway Projects
  - CR 94 (All Angels Hill Rd.) @ CR 93 (Myers Corners Rd.) (DC DPW) - 2009
  - I-84 @ Rt. 9D (NYSDOT) - 2014
  - Rt. 9 - Rt. 52 to CR 93 (Myers Corners Rd.) (NYSDOT) - 2015
  - I-84 - Rt. 9D to Rt. 9 (NYSDOT) - 2015

CR 77 (Vassar Rd.) – Spring Rd. to CR 110 (Jackson Rd.) (DC DPW) - 2015  
CR 40A (Saint Andrews Rd.) - Rt. 9 to Rt. 9G (DC DPW) - 2020

- Demand Management and CMAQ Projects  
MNR Parking Expansion (System wide) – 2006+  
TDM Unit Activities – On-going

Completing the Air Quality analysis on *Connections 2025* meant dealing with some long-range projects that are still in the conceptual stage. In accordance with the final transportation conformity rules by USEPA and NYSDOT, if adequate information was available to produce reasonable assumptions, then forecasts of the project impacts on vehicle miles travel and average vehicle speeds were produced. In some cases, sufficient data is not yet available to properly model the emissions. In these cases, the projects will be modeled as data becomes available and the results will be included when conformity is determined for updates to *Connections 2025* or to future Transportation Improvement Programs (TIP).

Future projects for which there was not enough data available to model include those still in the early development stages by their sponsors, such as the Taconic State Parkway - CR 29 (Carpenter Rd.) Intersection Improvements, Route 9-Route 44/55 interchange and the Route 52 By-pass in Fishkill.

### Results of Analysis

Dutchess County is part of the Mid-Hudson Ozone Non-attainment Area, which also includes Putnam and Northern Orange counties. As a “moderate ozone non-attainment area” an emissions reduction test is needed to demonstrate that Volatile Organic Compounds (VOC) and Nitrous Oxides (NOx) emissions in the “Action” scenario for each analysis year are less than baseline emissions (i.e.1990) to meet the conformity requirements for this type of area in the transportation conformity rule. Three years are considered for this conformity determination, “Action” years 2006, 2015, and 2025. Only the “Action” (Build) scenarios for these years are considered as allowed by the transportation conformity rule. A “No Build” comparison is not made.

Emission estimates were determined using the MOBILE6 emission model developed by US Environmental Protection Agency. The process involves using traffic volume and speed data provided by the PDCTC Staff along with the most recent fleet characteristics and other traffic and meteorological parameters (established by NYSDOT in cooperation with NYSDEC) in MOBILE6. The process then used emission rate results from MOBILE6 in conjunction with a distribution of traffic by vehicle mix and facility type, with estimates of vehicle miles of travel (VMT). The final product is an estimate of emissions of VOC and NOx.

The results show that in Dutchess County in the year 2025, implementing the projects and actions called for in the plan will reduce emissions of VOC by approximately 18,503.64 kilograms per day, and NOx by about 18,336.42 kilograms per day compared with the base year of 1990 (Figure 6-3). In addition, for all the milestone years, emissions of VOC and NOx are estimated to be lower than they were in 1990.

**Figure 6-3**  
**Results of Conformity Evaluation – Dutchess County**

Year	VOC		NOx	
	Emissions	Reductions*	Emissions	Reductions*
<b>1990</b>	21,232.77	n/a	20,686.90	n/a
<b>“Action Year” 2006</b>	8,387.74	12,845.03	10,947.12	9,739.78
<b>“Action Year” 2015</b>	4,013.72	17,219.05	4,734.21	15,952.69
<b>“Action Year” 2025</b>	2,729.13	18,503.64	2,350.47	18,336.42

\*kg/day reduced

The quantitative analysis demonstrates that *Connections 2025* would result in net emission reductions in all analysis years compared to 1990. Given that there are no Transportation Control Measures (TCMs) applicable to Dutchess County, this completes the conformity review. PDCTC Staff and NYSDOT-EAB have determined that *Connections 2025* is in conformance with the existing State Implementation Plan for air quality (SIP), and meets the requirements of the Clean Air Act Amendments of 1990 and the EPA's Transportation conformity rule. The basis for this determination is the regional emissions analysis that was conducted.

These results and are being reviewed by the ICG. Once they concur to these results and those from NOCTC, NYSDOT-EAB will perform the analysis for the Mid-Hudson Non-attainment area, and final approval will be given.

As part of the process of determining conformity for *Connections 2025* we are required to develop a Conformity Determination document. That document details the steps taken by the PDCTC to evaluate and determine that *Connections 2025* conforms to the SIP and all federal regulations for Air Quality. A copy is available at the PDCTC office at 27 High Street, Poughkeepsie, NY.

### **New York State Energy Plan**

The *New York State Energy Plan* (June 2002) was developed by the New York State Energy Planning Board to provide guidance to state agencies regarding energy development and use. There are five major policy objectives:

1. Supporting the continued safe, secure, and reliable operation of the State's energy and transportation systems infrastructures;
2. Stimulating sustainable economic growth, technological innovation, and job growth in the State's energy and transportation sectors, through competitive market development and government support;
3. Increasing energy diversity in all sectors of the State's economy through greater use of energy efficiency technologies, and alternative energy resources, including renewable-based energy;

4. Promoting and achieving a cleaner and healthier environment; and,
5. Ensuring fairness, equity, and consumer protections in an increasingly competitive market economy.

Transportation is a key component of the energy sector in New York State, and the Energy Plan discusses the ways that the State's transportation needs are related to the "complementary goals of fostering economic growth, preserving and enhancing the environment for an improved quality of life, and increasing energy efficiency."

### Energy Use

At the most basic level energy use in transportation is a combination of distance traveled (e.g. vehicle miles traveled) and fuel efficiency (e.g. miles per gallon). Reducing the amount of energy used for transportation can be accomplished by reducing miles traveled, increasing the number of people in a vehicle, increasing the fuel efficiency of vehicles, or by reducing delay created by congestion.

The Energy Plan examines a number of different actions that could help reduce total energy consumption and/or increase use of renewable or alternative energy sources. Actions that hold some promise for Dutchess County include:

- Intelligent Transportation Systems (ITS) projects – signal improvements, traveler information facilities
- Transportation Demand Management (TDM) activities – carpool programs, park and ride facilities, inter-county bus and ferry services.
- On-going commitment to infrastructure maintenance
- Maintaining local transit services
- Planning and implementing new bicycle and pedestrian facilities
- Exploring opportunities for the use of alternative fuels by local transit systems

Most of these activities are among the major recommendations of *Connections 2025*, and should assist Dutchess County and New York State achieve the overall goals of the Energy Plan.

### Energy Analysis

New York State Department of Transportation requested that the PDCTC complete an analysis of *Connections 2025* to determine if it were consistent with the goals and objectives of the New York State Energy Plan. The energy analysis was completed after the required federal air quality conformity analysis, and used some of the same planning assumptions.

The energy analysis included a calculation of four pollutants (volatile organic compounds, nitrogen oxides, carbon monoxide, and carbon dioxide), and energy use (direct and indirect).

Completion of the analysis was based on guidance received from NYSDOT Environmental Analysis Bureau (NYSDOT-EAB), which consists of three documents:

- Air Quality Analysis of Transportation Improvement Programs, Regional Transportation Plans, and Capital Project programs – Technical Guidance to Assist Metropolitan Planning Organizations and Department of Transportation Regional Offices Meet the Objectives of the 2002 New York State Energy Plan (January 21, 2003);
- *Development of Revised NYSDOT Energy Analysis Guidelines (Draft), Subtask 12a: Energy Analysis Guidelines for TIPs and Plans* (June 21, 2002); and
- *Development of Revised NYSDOT Energy Analysis Guidelines (Draft), Subtask 12b: Greenhouse Gases (CO<sub>2</sub>) Emissions Estimates for TIPs and Plans* (June 21, 2002)

As mentioned previously the PDCTC updated its regional travel demand model (TModel) to include all of the new regionally significant and non-exempt projects in *Connections 2025* (this became the “build” scenario for 2025). Energy analysis requires that in addition to the “build” scenario we look at what would happen if *Connections 2025* were not adopted. This is called the “no-build” scenario, and consists of the 2000 network with 2025 land-use. A comparison of the output from the two model scenarios shows the impact of the projects included in *Connections 2025*.

A quantitative analysis was also undertaken for those recommendations in *Connections 2025* that could not be modeled in TModel. This included transit projects, bicycle and pedestrian projects and transportation demand management (TDM) projects. Using information developed by the project sponsors, PDCTC calculated the reduction of VMT. The VMT reductions were then added to the TModel outputs in order to reflect a more accurate *Connections 2025* “build” scenario. This process differs from that used in Air Quality Analysis where only the results of VMT from TModel were used.

- VOC, NO<sub>x</sub>, and CO were analyzed by applying Emission Factors from NYSDOT guidance, to the VMT from the two scenarios. Results are expressed as grams emitted per mile.
- Direct energy was calculated by applying Fuel Consumption Rates, from NYSDOT guidance, to the VMT from the two scenarios. Indirect energy was calculated by applying Construction Energy Factors, from NYSDOT guidance, to the VMT from the two scenarios. Results are expressed as British Thermal Units (BTUs).

- Direct and indirect greenhouse gas (CO<sub>2</sub>) emissions were calculated by applying Carbon Emission Coefficients, from NYSDOT guidance, to the results of the direct and indirect energy calculations. Results are expressed as the total tons of carbon emitted

## Results

The results of the quantitative analyses demonstrate that the projects included in *Connections 2025* will decrease the emissions of VOC, NO<sub>x</sub>, CO, and CO<sub>2</sub> and the amount of direct energy consumed, albeit by small amounts (Figure 6-4).

*Connections 2025* includes some recommendations and actions for which a quantitative analysis is not currently practical. The *Greenway Connections* compact developed by Dutchess County and endorsed by 23 of the county's 30 municipalities includes policies and strategies that are intended to reinforce traditional development patterns. A strong commitment to the implementation of these strategies could reduce the reliance on automobiles for some routine trips and promote alternate forms of transportation such as transit, bicycling and walking.

In addition, *Connections 2025* includes a strong commitment to infrastructure maintenance and systems management (both traditional TSM and ITS) projects that have the potential to improve operations and reduce levels of congestion and the resulting vehicle hours of delay.

PDCTC is committed to working with New York State and its other partners to identify other projects and activities that are consistent with the objectives of the *New York State Energy Plan*.

**Figure 6-4 Summary**  
**Results of Energy Analysis**

Scenario	VMT	Air Pollution Emissions			Energy		Greenhouse Gas (CO <sub>2</sub> ) Emissions	
		VOC (grams)	NOx (grams)	CO (grams)	Direct (BTUs)	Indirect* (BTUs)	Direct (tons)	Indirect (tons)
<b>2025 no-build</b>	12,942,191	2,711,832	2,340,344	20,970,311	88,595,429,234	0	1,881	0
<b>2025 build</b>	12,795,695	2,686,366	2,313,442	20,777,352	87,592,599,725	233,214,914,504	1,860	5,076
<b>Change (build-no build)</b>	-146,495	-25,466	-26,901	-192,960	-1,002,829,509	--	-21	--
<b>% Change (build-no build)</b>	-1%	-1%	-1%	-1%	-1%	--	-1%	--

*\*The intent of the indirect energy and greenhouse gas calculations was to measure the impact of the construction of the projects new to Connections 2025.*

*The indirect energy used in the 2025 No-Build scenario is zero (as is the greenhouse gas emissions arising from the indirect energy used); therefore it is not possible to compute the percentage difference between the two scenarios.*